III. "The Ionisation of Dilute Solutions at the Freezing Point." By W. C. D. WHETHAM. Communicated by E. H. GRIFFITHS, F.R.S.

"Preliminary Note on the Spectrum of the Corona. Part 2." By Sir NORMAN LOCKYER, K.C.B., F.R.S. Received February 8,—Read February 22, 1900.

One of the chief results which, in my opinion, would be secured by the use of the prismatic camera in eclipse work was the differentiation between chromospheric and coronal phenomena. The photographs taken during the eclipses of 1893, 1896, and 1898 all enabled this distinction to be made very clearly, and various radiations formerly attributed to the corona have been shown to belong to the chromosphere alone. The photographs taken in Africa in 1893 showed eight rings in the spectrum of the corona; in Novaya Zemlaya, in 1896, with a less powerful instrument, a smaller number was secured; but those taken with increased dispersion in India, in 1898, show a much greater number.

I have already given the results of an inquiry into the wave-lengths of two of the chief coronal rings (5303·7 and 4231·3) as determined from photographs taken in 1898 with the 6-inch prismatic camera;* and as the results of the continued investigations may be of service to intending observers of the eclipse of next May, I give a short abstract of them in the present note.

Eight photographs were obtained during the time the spectrum of the corona was least admixed with that of chromosphere; of these, three taken with instantaneous exposures show only two or three of the brighter rings, so that five, showing many coronal rings, are suitable for measurement. The exposures of the photographs used for measurement were as follows, the ratio of focal length to aperture being 15:—

No. 2*a*	50	seconds.
2*c*	6	„
3*a*	12	„
3*c*	7	„
3*d*	8	„

During the earlier part of the exposure of plate 2*a*, the upper regions of the chromosphere were visible in the north-east, and some of the stronger chromospheric arcs appear, together with the coronal rings, in the corresponding parts of the images. In plates 3*c* and 3*d* chromospheric arcs appear in the south-west quadrant, together with

* 'Roy. Soc. Proc.,' vol. 64, p. 168.

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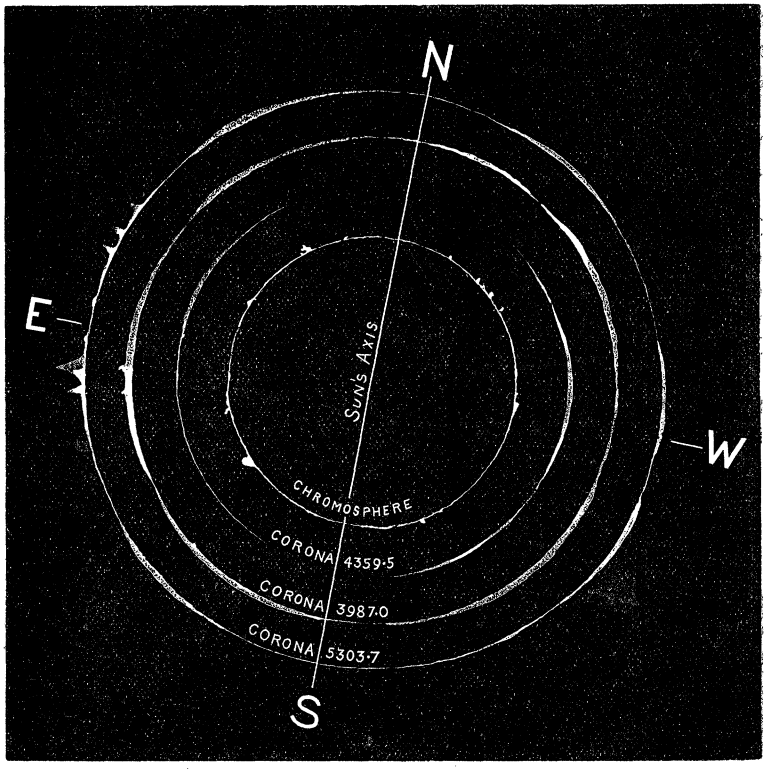
coronal rings; but, as I pointed out in the preliminary report on the observations at Viziadrug, the arcs and rings are readily distinguished.*

The coronal rings which have been noted on the photographs may be divided into three groups, defined by the position-angles in which they have their greatest brightness. The typical rings are (1) the green ring at λ 5303·7; (2) a violet ring at λ 3987, near Hε; and (3) a blue ring at λ 4359·5, near Hγ. The structure and brightness of these are shown in the accompanying diagram, but it may be remarked that the fainter members of the three groups do not exhibit the differences of structure so clearly.

Fig. 1.—Diagram showing the Forms of Three Typical Coronal Rings, and the Positions of the Prominences photographed at the same time.



The tables which follow show the wave-lengths of the rings which are believed to belong to each of the three groups, and indicate also the average brightness of each ring.

* 'Roy. Soc. Proc.,' vol. 64, p. 38.

Table of Coronal Rings.

Group I. Typical ring, λ 5303·7.

Wave-length.	Brightness. Max. = 10.	Wave-length.	Brightness. Max. = 10.
3952·5	2	4536	1
4007	1	4588·5	1
4022	1	4657	1
4056	2	4685·5	2
4068	1	4714	1
4085	1	4727	1
4121	1	4737	1
4168	1	4768	1
4220	2	4808	1
4231·3	5	4922	2
4248·5	2	5125	1
4262	1	5137	1
4400	1	5303·7	10
4430	1		
4518	1		

Group II. Typical ring, λ 3987·0.

Wave-length.	Brightness. Max. = 10.
3800	3
3987·0	5
4275	1
4568·5	3

Group III. Typical ring, λ 4359·5.

Wave-length.	Brightness. Max. = 10.
4030	1
4192	1
4204	1
4302	1
4323	2
4359·5	3
4485	1
4648	1
4662	1
4788	1
4890	1
5001	1
5255	1

I have already suggested that the different forms of the coronal rings indicate that they are not all due to the same substance, and the foregoing tables suggest that at least three substances are in question. The attempts which have so far been made to trace the origins of the rings, however, have led to no very definite results, and the coincidences with lines in the spectra of stars and nebulæ which were formerly suspected have not yet been completely established.

Special interest is attached to the question of the presence or absence of carbon flutings. There is a possible trace of the fluting,

commencing at λ 4736·18, which so far has not been observed in the chromosphere. The other flutings of carbon which are present in the chromosphere do not appear in the coronal spectrum.

The reductions indicate that there may be feeble indications of the presence of some of the chromospheric gases in the inner corona. Thus in photograph *3d*, on the north-eastern edge, fragments of rings corresponding to lines of helium at λλ 4472, 4714, and 4922 have been recorded; these occur also on the south-western limb, where the chromosphere itself is coming into view, but as the chromosphere was completely eclipsed in the north-east at this stage, the radiations mentioned as occurring there perhaps belong to the inner corona.

A very interesting result of this detailed examination of the photographs is that the chief coronal ring in the green is very closely associated with the form of the inner, and appears to have no distinct connection with the outer, corona. This suggests that the green line of the coronal spectrum is not produced in the outer corona, and that the indications of its presence there on previous occasions, as obtained by slit spectroscopes, were simply due to glare, as in the case of hydrogen and calcium. So far as the photographs taken with the prismatic cameras are concerned, the spectrum of the outer corona gives no indications of bright rings.

The measurements of the coronal rings and the diagram which accompanies this paper have been made by Mr. Fowler.

Dr. Lockyer has investigated the coronal spectrum in relation to carbon, and Mr. Baxandall has made comparisons with the spectra of stars and nebulæ.

"The Ionisation of Dilute Solutions at the Freezing Point." By W. C. D. WHETHAM, M.A., Fellow of Trinity College, Cambridge. Communicated by E. H. GRIFFITHS, F.R.S. Received February 14,—Read February 22, 1900.

(Abstract.)

It is known that the depression of the freezing point of water, produced by dissolving molecularly equivalent amounts of different acids and salts in a given quantity of it, is approximately proportional to the number of ions which these substances must be supposed to yield in order to explain their electrical conductivities. Again, as the concentration of a solution of one such substance is gradually increased, the molecular depression of the freezing point, and the equivalent electrical conductivity, both vary, and vary by amounts which seem in some cases to correspond, but in others to differ considerably.

There appeared reason to suppose that it was desirable to increase

FIG. 1.—Diagram showing the Forms of Three Typical Coronal Rings, and the Positions of the Prominences photographed at the same time.